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In reply refer to:
LMMS/VMD-98-307

September 21, 1998

National Aeronautics and Space Administration
Goddard Space Flight Center
Earth Sciences Procurement Office
Greenbelt Road
Greenbelt, MD 20771

Attn: Ms. Cynthia Dean, Contracting Officer, Code 219

Subject: NAS5-98044
Cirrus & Polar Stratospheric Cloud Studies with CLAES Data

Reference: Clause 27 - Reports of Work

Dear Ms. Dean:

In accordance with the reference contractual requirement, LMMS hereby submits the Monthly Progress Report for the period August 1, 1998 through August 31, 1998.

Please contact the undersigned at (650) 424-2001, if you have any questions. Further correspondence may be addressed to the attention of the undersigned at Organization 25-62, Building 255, at the above Palo Alto address. Our 24-hour facsimile number is (650) 424-3333. My e-mail address is: jinny.dougherty@lmco.com

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Nicole Wallace

for Virginia M. Dougherty
Contract Administration
Advanced Technology Center

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NASA Center for Aerospace Information
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Hanover, MD 21076-1320
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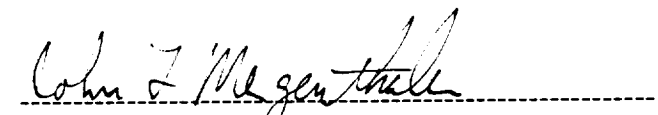
Monthly Report for NASA Contract NAS5-98044

Cirrus and Polar Stratospheric Cloud Studies with CLAES Data

Period Covered August 1, 1998 through August 31, 1998.

Prepared for:
NASA/Goddard Space Flight Center, Earth Sciences Procurement Office
Greenbelt, Maryland



J.L. Mergenthaler
Principal Investigator

Lockheed Martin Advanced Technology Center
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Palo Alto, CA 94304

Activity this period.

During this period we continued the comparison of CLAES cirrus occurrence observations with the SAGE II cirrus climatology (Wang et al., *JGR*, 101, pg. 29,407, 1996). Fig 1 a-d shows histograms of seasonal total cloud occurrence frequency in the tropics that provide an easy quantitative comparison of CLAES and SAGE II cloud amounts. Results show surprisingly good numerical agreement in total cloud fraction at the 100 hPa and 146 hPa and bigger numerical discrepancies at the 215 hPa and 68 hPa levels. A CLAES cloud occurrence was determined from the "3at" AERO780 aerosol volume absorption coefficient data. An absorption coefficient greater than a threshold, C_T=9.0E-04 km^{-1} was classified as a cloud occurrence. Cloud-obscured portions of aerosol profiles were eliminated from the statistical analysis by establishing a error threshold E_T. Any aerosol profile data below a level where E_T >30% was considered unreliable and eliminated from the cloud counting statistics. The results of sensitivity studies on the selection of C_T and E_T also shown on Fig. 1 indicate that the cloud occurrence frequency at 68 hPa and 100 hPa are sensitive to the choice of C_T.. In our analysis the we use the lowest C_T that eliminates Mt. Pinatubo sulfate aerosol; this procedure inevitably misses some thin cirrus that could be observed in a cleaner atmosphere. There is not a dramatic response to 20% variations in E_T at any level, but as one would expect, the cloud occurrence frequency at lower altitudes shows the most sensitivity.

The largest disagreement between the SAGE II and CLAES cloud occurrence frequencies appears at 68 hPa where we have compared CLAES data with SAGE II 17.5 km subvisible cirrus statistics. That more clouds occur in the CLAES data may be due differences in viewing height in this region of steep vertical gradients in cloud occurrence. In the paper being prepared for publication this plot is discussed in more detail giving possible reasons for cloud counting differences by level and season.

Before publication we want to assess the influence of scattering of upwelling radiation on the CLAES cirrus measurement. If scattered upwelling radiation is interpreted as thermal emission from the cirrus particles this would erroneously enhance the retrieved aerosol volume absorption coefficient and make comparisons with the SAGE II aerosol volume extinction coefficients difficult to explain. We are planning a "worst case scenario" calculation using radiative transfer codes (Mie Codes and FASCODE3) to evaluate the effect when thin cirrus overlays a warm tropical ocean with no clouds between. The results of this calculation are also useful for evaluating diurnal variations in cloud occurrence frequency statistics.

These studies along with discussions of with discussion of CLAES and SAGE II sensitivities round out the nearly complete paper to be submitted to either *Geophysical Research Letters* or *Journal of Geophysical Research* , depending on its final length.

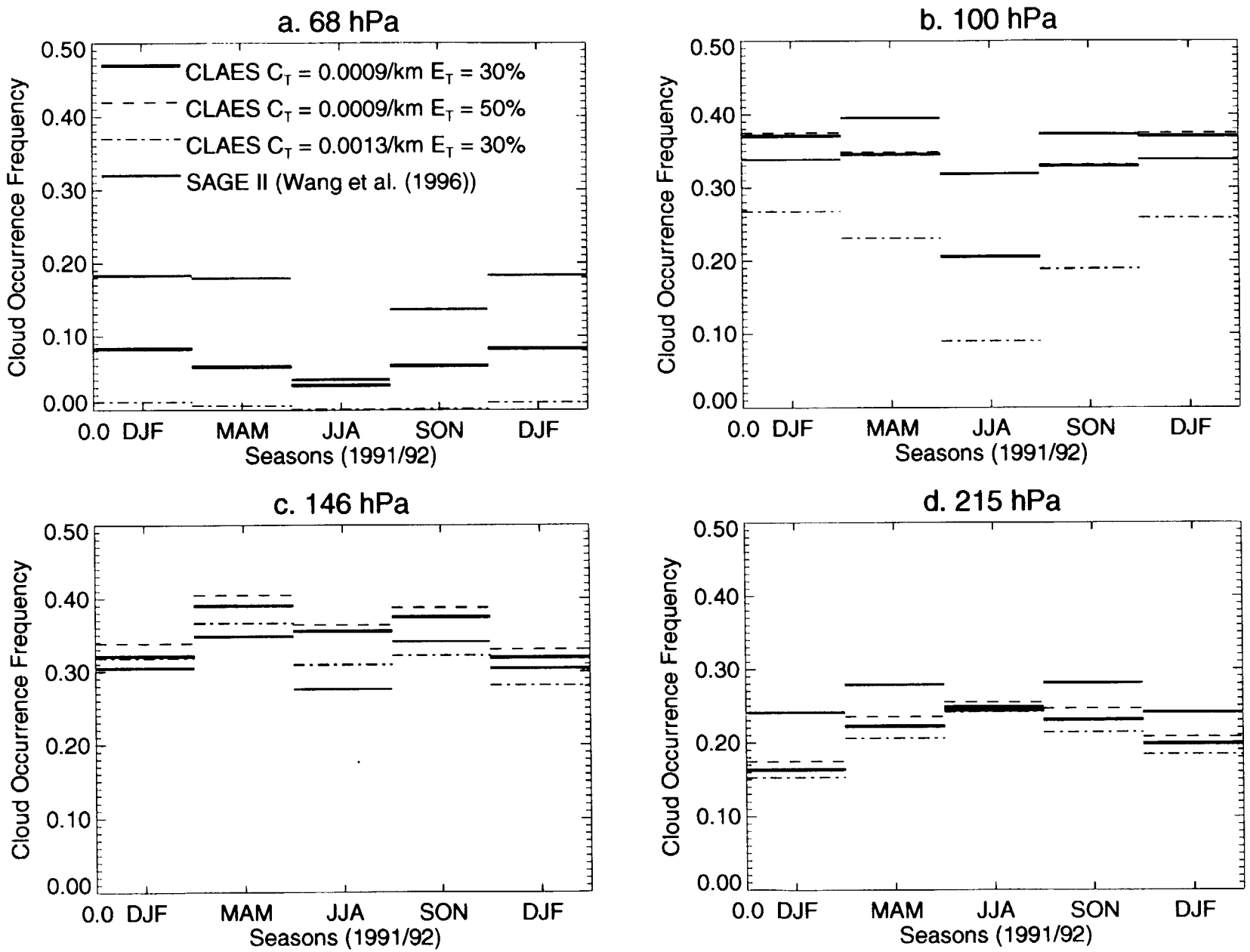
Plans for next month:

Continue research and writing the paper, "CLAES Observations of Tropical Cirrus",

Continue efforts to reconcile the CLAES observations with other data sources.

Support other UARS investigators using cirrus and PSC data.

Fig 1


a. 68 hPa
b. 100 hPa
c. 146 hPa
d. 215 hPa
CLAES C_T = 0.0009/km E_T = 30%
CLAES C_T = 0.0009/km E_T = 50%
CLAES C_T = 0.0013/km E_T = 30%
SAGE II (Wang et al. (1996))
Cloud Occurrence Frequency
0.00
0.10
0.20
0.30
0.40
0.50
0.0 DJF
MAM
JJA
SON
DJF
Seasons (1991/92)

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